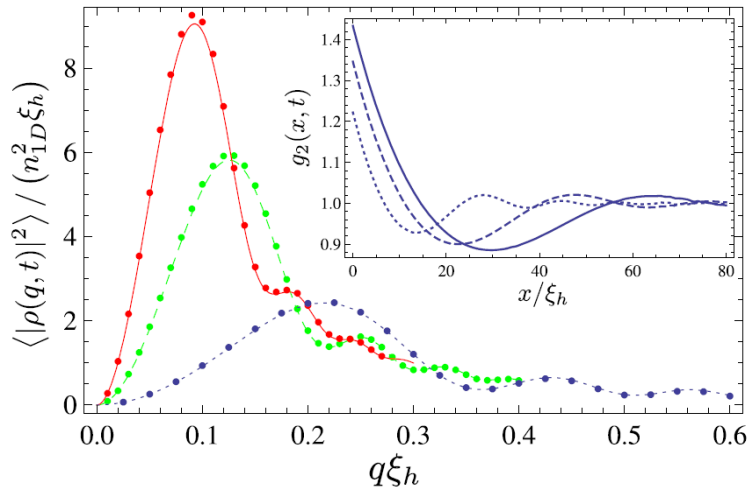


**Density Ripples in expanding low-dimensional gases as a probe of correlations**

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We investigate theoretically the evolution of the two-point density correlation function of a low-dimensional ultracold Bose gas after release from a tight transverse confinement. In the course of expansion thermal and quantum fluctuations present in the trapped systems transform into density fluctuations. For the case of free ballistic expansion relevant to current experiments, we present simple analytical relations between the spectrum of “density ripples” and the correlation functions of the original confined systems. We analyze several physical regimes, including weakly and strongly interacting one-dimensional (1D) Bose gases and two-dimensional (2D) Bose gases below the Berezinskii-Kosterlitz-Thouless (BKT) transition. For weakly interacting 1D Bose gases, we obtain an explicit analytical expression for the spectrum of density ripples which can be used for thermometry. This method has been applied in recent experiments.



The figure shows the spectral power density and second-order correlation function (inset) of an expanding 1D Bose gas for different expansion times. The quantities are accessible in experiments.